FORM PTO-1390 (Modified) (REV 11-98) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
112740-216	
U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR	
09/831122	

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE99/03499	02 November 1999	14 November 1998

TITLE OF INVENTION

METHOD FOR TRANSMITTING INFORMATION SIGNALS IN A SUBSCRIBER LINE DOMAIN

APPLICANT(S) FOR DO/EO/US

Holger Gothe et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☒ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☒ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

Submission of Drawings Figures 1-2 on one sheet

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/831122	PCT/DE99/03499	112740-216

21. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☐	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO and International Search Report not prepared by the EPO or JPO	**$1,000.00**
☒	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but Internation Search Report prepared by the EPO or JPO	**$860.00**
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	**$710.00**
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)	**$690.00**
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)	**$100.00**

ENTER APPROPRIATE BASIC FEE AMOUNT = **$860.00**

Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)). **$0.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	4 - 20 =	0	x $18.00	**$0.00**
Independent claims	1 - 3 =	0	x $80.00	**$0.00**
Multiple Dependent Claims **(check if applicable).**			☐	**$0.00**

TOTAL OF ABOVE CALCULATIONS = **$860.00**

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable).** ☐ **$0.00**

SUBTOTAL = **$860.00**

Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). + **$0.00**

TOTAL NATIONAL FEE = **$860.00**

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐ **$0.00**

TOTAL FEES ENCLOSED = **$860.00**

Amount to be: refunded	$
charged	$

☒ A check in the amount of **$860.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. in the amount of to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **02-1818** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

William E. Vaughan
Bell, Boyd & Lloyd LLC
P.O. Box 1135
Chicago, IL 60690-1135

SIGNATURE

William E. Vaughan
NAME

39,056
REGISTRATION NUMBER

May 4, 2001
DATE

09/831122

JC03 Rec'd PCT/PTO 04 MAY 2001

CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10) Applicant(s): **Holger Gothe et al.**			Docket No. **112740-216**
Serial No.	Filing Date	Examiner	Group Art Unit

Invention: **METHOD FOR TRANSMITTING INFORMATION SIGNALS IN A SUBSCRIBER LINE DOMAIN**

I hereby certify that the following correspondence:

Transmittal Letter to the United States Designated/Elected Office in duplicate, international application as filed, English translation, search report, Preliminary Amendment, Submission of Drawings Figures 1-2 on one sheet, filing fee $860.00, postcard

(Identify type of correspondence)

is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 in an envelope addressed to: The Assistant Commissioner for ~~Patents~~, Washington, D.C. 20231 on

May 4, 2001
(Date)

Robert Bucheri
(Typed or Printed Name of Person Mailing Correspondence)

(Signature of Person Mailing Correspondence)

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IN THE UNITED STATES ELECTED/DESIGNATED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

PRELIMINARY AMENDMENT

APPLICANTS:	Holger Gothe et al.	DOCKET NO: 112740-216
SERIAL NO:		GROUP ART UNIT:
		EXAMINER:
INTERNATIONAL APPLICATION NO:		PCT/DE99/03499
INTERNATIONAL FILING DATE:		02 November 1999
INVENTION:	METHOD FOR TRANSMITTING INFORMATION SIGNALS IN A SUBSCRIBER LINE DOMAIN	

Assistant Commissioner for Patents,
Washington, D.C. 20231

Sir:

Please amend the above-identified International Application before entry into the National stage before the U.S. Patent and Trademark Office under 35 U.S.C. §371 as follows:

In the Specification:

Please replace the Specification of the present application, including the Abstract, with the following Substitute Specification:

SPECIFICATION

TITLE

METHOD FOR TRANSMITTING INFORMATION SIGNALS IN A SUBSCRIBER LINE DOMAIN

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates, generally, to a method for transmitting information signals in a subscriber line domain and, more particularly, to such a

method wherein information signals and control signals are transmitted in a frame structure at variable speeds, and the control signals are used for matching the transmission speed to the requirements of a subscriber.

Description of the Prior Art

As transmission speeds continually increase, it is useful to use transmission techniques which permit optimum utilization of the transmission medium. In the subscriber line domain, the transmission medium used is cables. Optimum utilization is achieved when the transmission rate has been matched to the bandwidth of the cable. This circumstance already has been taken into account in the bit-oriented UEB transmission technique. With this transmission technique, however, it is not possible to transmit additional information, such as control information for the user data, for example.

In addition, the HSDL transmission method is known as a structured baseband technique in the prior art. However, the transmission rate cannot be matched to the cable with this method. As such, the necessary circuit complexity and costs are high for all subscribers (even with a short cable or low demands on the transmission rate).

The present invention, therefore, is directed to demonstrating a way of being able to transmit information signals in the subscriber line domain dynamically at different speeds between two transmission devices.

SUMMARY OF THE INVENTION

Accordingly, in an embodiment of the present invention, a method is provided for selectively changing a transmission speed between a first transmission device in at least one further transmission device, wherein a subscriber line network links the first transmission device to the further transmission device and provides a path via which information signals and control signals are routed, and wherein transmission between the first transmission device and the further transmission device occurs in both directions such that each of the first transmission device and the further transmission device may serve as both a

transmitting device and a receiving device, the method including the steps of: inserting the information signals and the control signals into a frame structure; providing a management channel in the frame structure in which information relating to an increase in the transmission speed is communicated to a receiving device; transmitting, via a sending device, the information signals at an increased transmission speed, wherein synchronism with the receiving device is lost; and increasing the transmission speed, via the receiving device and upon receiving the information transmitted in the management channel, until the synchronism with the sending device is restored.

In an embodiment, the frame structure is formed from at least one superframe having a number of single frames.

In another embodiment, the first transmission device is a multiplex device.

In a further embodiment, the further transmission device is a subscriber terminal.

One advantage of the present invention is, in particular, the provision of a frame structure for various transmission rates, within which frame structure the individual information is transmitted. In this context, the frameless UEB technology used in the prior art has been extended by frames. In this frame structure, besides the actual user data, information for byte-oriented transmission, a management channel for the interchange of control information and a CRC channel for assessing the quality of the transmission operation are additionally transmitted. These individual items of information can be transmitted at various n x 64 kbit/s transmission rates using one and the same structure.

In addition, this frame structure can be used to transmit an 8 kHz information item concurrently at any desired transmission rate. This information item is used, by way of example, in the ISDN for selecting individual 64 kbit/s channels (B channels). In the management channel, control information can be interchanged. This information can be used, by way of example, for changing over the transmission rate during operation.

Additional features and advantages of the present invention are described in, and will be apparent from, the Detailed Description of the Preferred Embodiments and the Drawings.

DESCRIPTION OF THE DRAWINGS

Figure 1 shows a typical structure of a subscriber line network; and

Figure 2 shows a frame structure according to the teachings of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows, as a typical application, a multiplexer MUX which is connected to a number of subscriber terminals $T_1...T_n$ via connections $V_1...V_n$. The latter are in the form of permanent connections in this case. Accordingly, the actual data transmission is maintained constantly. The connection is set up or cleared down only during installation or when the speed is changed over.

The permanent connections are now used to transmit the user data using an EDSL transmission technique; in each case, at any desired transmission rate. In this context, the sending and receiving transmission devices have the same level of authorization for setting up or clearing down a connection. As such, there is no prioritization as in the case of the known HDSL transmission technique, for example. The influence of erroneous settings is thus significantly reduced.

Figure 2 shows the structure of the data transmission method EDSL. In this context, user information D, frame information S for distinguishing individual 64 kbit/s channels, management information M and monitoring information C for assessing the quality of the transmission medium are transmitted. To this end, superframes are provided in the data transmission method EDSL. A superframe holds 8 single frames. Each superframe is allocated 384 user data bits and the additional bits. An externally supplied 8 kHz clock signal synchronizes the superframe. The superframe is designed such that, at various transmission rates, it is given the correct position with respect to the 8 kHz clock signal, which can be output with the correct phase again at the reception end.

The superframe is triggered at the transmission end as a result of the 8 kHz edges being counted. The length of the counter required for this purpose is oriented toward the lowest speed. Thus, by way of example, a superframe contains a total of 48 bytes (6 x 8 bytes) at a transmission speed of n x 64 kbit/s (n = 1, 2, 4, 8, 16), since the most 8 kHz edges per superframe appear at this speed. At the next highest speed, the trigger pulse is produced only with each second frame etc., which is generally adequate.

At the receiver end, the superframe information item is used in inverted form for outputting the 8 kHz clock signal. To this end, the counter producing the 8 kHz clock signal is, in turn, triggered by the start of the superframe, which is likewise adequate. At a transmission rate of 64 kbit/s, the triggering occurs after each 48th 8 kHz period.

The superframe is formed by a frame sync word which permits unique allocation of the single frames and, to this end, is evaluated and monitored by the synchronization device at the reception end. By changing the frame structure (e.g., doubling the lengths), it is also possible to implement other n multiples of 64 kbit/s.

A single frame has 52 bits in this case. Of the 52 bits, a total of 48 user data bits are provided and 4 further bits. The latter include the sync bit S, 2 management bits M and a CRC bit C. The latter is used for error monitoring. Eight sync bits form the frame sync word which is received and evaluated at the reception end. If the receiver receives a frame sync word in full, the frame structure can be restored.

The text below demonstrates how the transmission speed is changed during the transmission operation.

By way of example, it may be assumed that information signals are transmitted between the multiplexer MUX and one of the terminals $T_1 \ldots T_n$ (e.g. T_4) at a particular speed. In this case, transmission takes place in both directions such that each of the multiplexer MUX and the terminals $T_1 \ldots T_n$ may serve as

both a transmitting device and a receiving device. Subsequently, the information signals now need to be transmitted at a higher speed. The change in speed will be controlled from the multiplexer MUX; it also would be possible to control it from the terminal T_4. The multiplexer MUX now informs the terminal T_4, via the management channel M, that the transmission speed is to be increased. At the same time, a timer chip is initiated. When it has run out, the speed is increased in the multiplexer. The terminal receives the information item relating to the speed increase via the management channel M. The terminal T_4 subsequently returns an acknowledgement signal to the multiplexer MUX. At the same time, the terminal T_4 increases the speed.

When one of the transmission devices increases the speed, whether it be the multiplex device or the terminal, the synchronism in the respective terminal is lost. To this extent, the respective terminal needs to search for new synchronism. This is done by virtue of the sync word being received. If the new synchronism has been found, the information signals can be sent at an increased speed.

In the case of erroneous transmission (e.g., due to lack of bandwidth in the cable), the receiver is not able to correct distortions in the received signal to an adequate extent, the sync word is not recognized, and synchronism is thus lost. After a prescribed time, the original speed is adopted again.

Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.

ABSTRACT OF THE DISCLOSURE

As transmission speeds continuously increase, it is necessary to use transmission techniques which permit optimum utilization of the particular transmission medium. In the subscriber line domain, the transmission medium used is cables. In this case, the transmission rates need to be matched to the bandwidth of the cable during operation as well. The transmission methods used

in the prior art are able to meet these requirements only to a limited extent. The present invention thus transmits information signals and control signals being transmitted in a frame structure at variable speeds, enables the control signals to be used for matching the transmission speed to the cable and to the requirements of the subscriber.

In the claims:

Please cancel claims 1-4, without prejudice, and substitute the following left-hand justified heading therefor:

We Claim as Our Invention:

5. A method for selectively changing a transmission speed between a first transmission device and at least one of a plurality of further transmission devices, wherein a subscriber line network links the first transmission device to the plurality of further transmission devices and provides a path via which information signals and control signals are routed, and wherein transmission between the first transmission device and the at least one of the plurality of further transmission devices occurs in both directions such that each of the first transmission device and the plurality of further transmission devices may serve as both a transmitting device and a receiving device, the method comprising the steps of:

inserting the information signals and the control signals into a frame structure;

providing a management channel in the frame structure in which information relating to an increase in the transmission speed is communicated to a receiving device;

transmitting, via a sending device, the information signals at an increased transmission speed, wherein synchronism with the receiving device is lost; and

increasing the transmission speed, via the receiving device and upon receiving the information transmitted in the management channel, until the synchronism with the sending device is restored.

6. A method for selectively changing a transmission speed between a first transmission device and at least one of a plurality of further transmission devices as claimed in claim 5, the method further comprising the step of:

forming the frame structure from at least one superframe having a plurality of single frames.

7. A method for selectively changing a transmission speed between a first transmission device and at least one of a plurality of further transmission devices as claimed in claim 5, wherein the first transmission device is a multiplex device.

8. A method for selectively changing a transmission speed between a first transmission device and at least one of a plurality of further transmission devices as claimed in claim 5, wherein the plurality of further transmission devices are subscriber terminals.

REMARKS

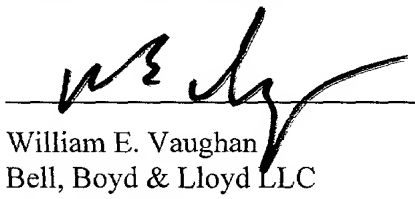
The present amendment makes editorial changes and corrects typographical errors in the specification, which includes the Abstract, in order to conform the specification to the requirements of United States Patent Practice. No new matter is added thereby. Attached hereto is a marked-up version of the changes made to the specification by the present amendment. The attached page is captioned "**Version With Markings To Show Changes Made".**

In addition, the present amendment cancels original claims 1-4 in favor of new claims 5-8. Claims 5-8 have been presented solely because the revisions by red-lining and underlining which would have been necessary in claims 1-4 in order to present those claims in accordance with preferred United States Patent Practice would have been too extensive, and thus would have been too burdensome. The present amendment is intended for clarification purposes only

and not for substantial reasons related to patentability pursuant to 35 USC §§103, 102, 103 or 112. Indeed, the cancellation of claims 1-4 does not constitute an intent on the part of the Applicants to surrender any of the subject matter of claims 1-4.

Early consideration on the merits is respectfully requested.

Respectfully submitted,



(Reg. No. 39,056)

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(312) 807-4292
Attorneys for Applicants

VERSIONS WITH MARKINGS TO SHOW CHANGES MADE

In The Specification:

The Specification of the present application, including the Abstract, has been amended as follows:

SPECIFICATION

TITLE

~~**Method for transmitting information signals in the subscriber line domain**~~

METHOD FOR TRANSMITTING INFORMATION SIGNALS IN A SUBSCRIBER LINE DOMAIN

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates, generally, to a method for transmitting information signals in a subscriber line domain and, more particularly, to such a method wherein information signals and control signals are transmitted in a frame structure at variable speeds, and the control signals are used for matching the transmission speed to the requirements of a subscriber.

Description of the Prior Art

~~The invention relates to a method in accordance with the precharacterizing clause of patent claim 1.~~

As transmission speeds continually increase, it is useful to use transmission techniques which permit optimum utilization of the transmission medium. In the subscriber line domain, the transmission medium used is cables. Optimum utilization is achieved when the transmission rate has been matched to the bandwidth of the cable. This circumstance ~~has~~ already has been taken into account in the bit-oriented UEB transmission technique. With this transmission technique, however, it is not possible to transmit additional information, such as control information for the user data, for example.

In addition, the HSDL transmission method is known as a structured baseband technique in the prior art. However, the transmission rate cannot be

matched to the cable with this method~~,~~. ~~which means that~~ As such, the necessary circuit complexity and costs are high for all subscribers (even with a short cable or low demands on the transmission rate).

The present invention, therefore, is directed to ~~is based on the object of~~ demonstrating a way of being able to transmit information signals in the subscriber line domain dynamically at different speeds between two transmission devices.

~~The object is achieved, on the basis of the precharacterizing clause of patent claim 1, by the characterizing features of said claim.~~

SUMMARY OF THE INVENTION

Accordingly, in an embodiment of the present invention, a method is provided for selectively changing a transmission speed between a first transmission device in at least one further transmission device, wherein a subscriber line network links the first transmission device to the further transmission device and provides a path via which information signals and control signals are routed, and wherein transmission between the first transmission device and the further transmission device occurs in both directions such that each of the first transmission device and the further transmission device may serve as both a transmitting device and a receiving device, the method including the steps of: inserting the information signals and the control signals into a frame structure; providing a management channel in the frame structure in which information relating to an increase in the transmission speed is communicated to a receiving device; transmitting, via a sending device, the information signals at an increased transmission speed, wherein synchronism with the receiving device is lost; and increasing the transmission speed, via the receiving device and upon receiving the information transmitted in the management channel, until the synchronism with the sending device is restored.

In an embodiment, the frame structure is formed from at least one superframe having a number of single frames.

In another embodiment, the first transmission device is a multiplex device.

In a further embodiment, the further transmission device is a subscriber terminal.

One advantage of the present invention is, in particular, the provision of a frame structure for various transmission rates, within which frame structure the individual information is transmitted. In this context, the frameless UEB technology used in the prior art has been extended by frames. In this frame structure, besides the actual user data, information for byte-oriented transmission, a management channel for the interchange of control information and a CRC channel for assessing the quality of the transmission operation are ~~also~~ additionally transmitted ~~in addition~~. These individual items of information can be transmitted at various n x 64 kbit/s transmission rates using one and the same structure.

In addition, this frame structure can be used to transmit an 8 kHz information item concurrently at any desired transmission rate. This information item is used, by way of example, in the ISDN for selecting individual 64 kbit/s channels (B channels). In the management channel, control information can be interchanged. This information can be used, by way of example, for changing over the transmission rate during operation.

Additional features and advantages of the present invention are described in, and will be apparent from, the Detailed Description of the Preferred Embodiments and the Drawings.

~~Advantageous developments of the invention are specified in the subclaims.~~

~~The invention is explained in more detail below with the aid of an exemplary embodiment.~~

~~In the drawing~~

DESCRIPTION OF THE DRAWINGS

Figure 1 shows ~~the~~ a typical structure of a subscriber line network~~,~~; and

Figure 2 shows ~~the~~ a frame structure according to the teachings of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows, as a typical application, a multiplexer MUX which is connected to a ~~plurality~~ number of subscriber terminals $T_1...T_n$ via connections $V_1...V_n$. The latter are in the form of permanent connections in this case. ~~This means that~~ Accordingly, the actual data transmission is maintained constantly. The connection is set up or cleared down only during installation or when the speed is changed over.

The permanent connections are now used to transmit the user data using an EDSL transmission technique~~,~~; in each case, at any desired transmission rate. In this context, the sending and receiving transmission devices have the same level of authorization for setting up or clearing down a connection. ~~This means that~~ As such, there is no prioritization as in the case of the known HDSL transmission technique, for example. The influence of erroneous settings is thus significantly reduced.

Figure 2 shows the structure of the data transmission method EDSL. In this context, user information D, frame information S for distinguishing individual 64 kbit/s channels, management information M and monitoring information C for assessing the quality of the transmission medium are transmitted. To this end, superframes are provided in the data transmission method EDSL. A superframe holds 8 single frames. Each superframe is allocated 384 user data bits and the additional bits. An externally supplied 8 kHz clock signal synchronizes the superframe. The superframe is designed such that, at various transmission rates, it is given the correct position with respect to the 8 kHz clock signal, which can be output with the correct phase again at the reception end.

The superframe is triggered at the transmission end as a result of the 8 kHz edges being counted. The length of the counter required for this purpose is oriented toward the lowest speed. Thus, by way of example, a superframe

contains a total of 48 bytes (6 x 8 bytes) at a transmission speed of n x 64 kbit/s (n = 1, 2, 4, 8, 16), since the most 8 kHz edges per superframe appear at this speed. At the next highest speed, the trigger pulse is produced only with each second frame etc., which is generally adequate.

At the receiver end, the superframe information item is used in inverted form for outputting the 8 kHz clock signal. To this end, the counter producing the 8 kHz clock signal is, in turn, triggered by the start of the superframe, which is likewise adequate. At a transmission rate of 64 kbit/s, the triggering occurs after each 48th 8 kHz period.

The superframe is formed by a frame sync word which permits unique allocation of the single frames and, to this end, is evaluated and monitored by the synchronization device at the reception end. By changing the frame structure (e.g., doubling the lengths), it is also possible to implement other n multiples of 64 kbit/s.

A single frame has 52 bits in this case. Of the 52 bits, a total of 48 user data bits are provided and 4 further bits. The latter include the sync bit S, 2 management bits M and a CRC bit C. The latter is used for error monitoring. Eight sync bits form the frame sync word which is received and evaluated at the reception end. If the receiver receives a frame sync word in full, the frame structure can be restored.

The text below demonstrates how the transmission speed is changed during the transmission operation.

By way of example, it may be assumed that information signals are transmitted between the multiplexer MUX and one of the terminals $T_1 ... T_n$ (e.g. T_4) at a particular speed. In this case, transmission takes place in both directions such that each of the multiplexer MUX and the terminals $T_1 ... T_n$ may serve as both a transmitting device and a receiving device. Subsequently, the information signals now need to be transmitted at a higher speed. The change in speed will be controlled from the multiplexer MUX; it ~~would~~ also would be possible to control

it from the terminal T_4. The multiplexer MUX now informs the terminal T_4, via the management channel M, that the transmission speed is to be increased. At the same time ~~as this~~, a timer chip is initiated~~.~~ ~~and when~~ When it has run out, the speed is increased in the multiplexer. The terminal receives the information item relating to the speed increase via the management channel M. The terminal T_4 subsequently returns an acknowledgement signal to the multiplexer MUX. At the same time ~~as this~~, the terminal T_4 increases the speed.

When one of the transmission devices increases the speed, whether it be the multiplex device or the terminal, the synchronism in the ~~remote station~~ respective terminal is lost. To this extent, the ~~remote station~~ respective terminal needs to search for new synchronism. This is done by virtue of the sync word being received. If the new synchronism has been found, the information signals can be sent at an increased speed.

In the case of erroneous transmission (e.g., ~~on account of~~ due to lack of bandwidth in the cable), the receiver is not able to correct distortions in the received signal to an adequate extent, ~~and~~ the sync word is not recognized~~.~~ ~~The~~ and synchronism ~~between the [lacuna]~~ is thus lost. After a prescribed time, the original speed is adopted again.

Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.

~~Abstract~~

ABSTRACT OF THE DISCLOSURE

~~Method for transmitting information signals in the subscriber line domain.~~

As transmission speeds continuously increase, it is necessary to use transmission techniques which permit optimum utilization of the particular transmission medium. In the subscriber line domain, the transmission medium used is cables. In this case, the transmission rates need to be matched to the bandwidth of the cable during operation as well. The transmission methods used in the prior art are able to meet these requirements only to a limited extent. The present invention ~~provides a remedy for this by virtue of~~ thus transmits information signals and control signals being transmitted in a frame structure at variable speeds, ~~and by virtue of~~ enables the control signals ~~being able~~ to be used for matching the transmission speed to the cable and to the requirements of the subscriber.

~~Figure 2~~

Description

Method for transmitting information signals in the subscriber line domain.

The invention relates to a method in accordance with the precharacterizing clause of patent claim 1.

As transmission speeds continually increase, it is useful to use transmission techniques which permit optimum utilization of the transmission medium. In the subscriber line domain, the transmission medium used is cables. Optimum utilization is achieved when the transmission rate has been matched to the bandwidth of the cable. This circumstance has already been taken into account in the bit-oriented UEB transmission technique. With this transmission technique, however, it is not possible to transmit additional information, such as control information for the user data, for example.

In addition, the HSDL transmission method is known as a structured baseband technique in the prior art. However, the transmission rate cannot be matched to the cable with this method, which means that the necessary circuit complexity and costs are high for all subscribers (even with a short cable or low demands on the transmission rate).

The invention is based on the object of demonstrating a way of being able to transmit information signals in the subscriber line domain dynamically at different speeds between two transmission devices.

The object is achieved, on the basis of the precharacterizing clause of patent claim 1, by the characterizing features of said claim.

One advantage of the invention is, in particular, the provision of a frame structure for various transmission rates, within which frame structure the individual information is transmitted. In this context, the frameless UEB technology used in the prior art has been extended by frames. In this frame structure, besides the actual user data, information for byte-oriented transmission, a management channel for the interchange of control information and a CRC channel for assessing the quality of the transmission operation are also transmitted in addition. These individual items of information can be transmitted at various n x 64 kbit/s transmission rates using one and the same structure.

In addition, this frame structure can be used to transmit an 8 kHz information item concurrently at any desired transmission rate. This information item is used, by way of example, in the ISDN for selecting individual 64 kbit/s channels (B channels). In the management channel, control information can be interchanged. This information can be used, by way of example, for changing over the transmission rate during operation.

Advantageous developments of the invention are specified in the subclaims.

The invention is explained in more detail below with the aid of an exemplary embodiment.

In the drawing

Figure 1 shows the typical structure of a subscriber line network,

Figure 2 shows the frame structure according to the invention.

Figure 1 shows, as a typical application, a multiplexer MUX which is connected to a plurality of subscriber terminals $T_1 \ldots T_n$ via connections $V_1 \ldots V_n$. The latter are in the form of permanent connections in this case. This means that

the actual data transmission is maintained constantly. The connection is set up or cleared down only during installation or when the speed is changed over.

The permanent connections are now used to transmit the user data using an EDSL transmission technique, in each case at any desired transmission rate. In this context, the sending and receiving transmission devices have the same level of authorization for setting up or clearing down a connection. This means that there is no prioritization as in the case of the known HDSL transmission technique, for example. The influence of erroneous settings is thus significantly reduced.

Figure 2 shows the structure of the data transmission method EDSL. In this context, user information D, frame information S for distinguishing individual 64 kbit/s channels, management information M and monitoring information C for assessing the quality of the transmission medium are transmitted. To this end, superframes are provided in the data transmission method EDSL. A superframe holds 8 single frames. Each superframe is allocated 384 user data bits and the additional bits. An externally supplied 8 kHz clock signal synchronizes the superframe. The superframe is designed such that, at various transmission rates, it is given the correct position with respect to the 8 kHz clock signal, which can be output with the correct phase again at the reception end.

The superframe is triggered at the transmission end as a result of the 8 kHz edges being counted. The length of the counter required for this purpose is oriented toward the lowest speed. Thus, by way of example, a superframe contains a total of 48 bytes (6 x 8 bytes) at a transmission speed of n x 64 kbit/s (n = 1, 2, 4, 8, 16), since the most 8 kHz edges per superframe appear at this speed. At the next highest speed, the trigger pulse is produced only with each second frame etc., which is generally adequate.

At the receiver end, the superframe information item is used in inverted form for outputting the 8 kHz clock signal. To this end, the counter producing the 8 kHz clock signal is in turn triggered by the start of the superframe, which is likewise adequate. At a transmission rate of 64 kbit/s, the triggering occurs after each 48th 8 kHz period.

The superframe is formed by a frame sync word which permits unique allocation of the single frames and, to this end, is evaluated and monitored by the synchronization device at the reception end. By changing the frame structure (e.g. doubling the lengths), it is also possible to implement other n multiples of 64 kbit/s.

A single frame has 52 bits in this case. Of the 52 bits, a total of 48 user data bits are provided and 4 further bits. The latter include the sync bit S, 2 management bits M and a CRC bit C. The latter is used for error monitoring. Eight sync bits form the frame sync word which is received and evaluated at the reception end. If the receiver receives a frame sync word in full, the frame structure can be restored.

The text below demonstrates how the transmission speed is changed during the transmission operation.

By way of example, it may be assumed that information signals are transmitted between the multiplexer MUX and one of the terminals $T_1 \ldots T_n$ (e.g. T_4) at a particular speed. In this case, transmission takes place in both directions. Subsequently, the information signals now need to be transmitted at a higher speed. The change in speed will be controlled from the multiplexer MUX; it would also be possible to control it from the terminal T_4. The multiplexer MUX now informs the terminal T_4, via the management channel M, that the transmission speed is to be increased. At the same time as this,

a timer chip is initiated, and when it has run out, the speed is increased in the multiplexer. The terminal receives the information item relating to the speed increase via the management channel M. The terminal T_4 subsequently returns an acknowledgement signal to the multiplexer MUX. At the same time as this, the terminal T_4 increases the speed.

When one of the transmission devices increases the speed, whether it be the multiplex device or the terminal, the synchronism in the remote station is lost. To this extent, the remote station needs to search for new synchronism. This is done by virtue of the sync word being received. If the new synchronism has been found, the information signals can be sent at an increased speed.

In the case of erroneous transmission (e.g. on account of lack of bandwidth in the cable), the receiver is not able to correct distortions in the received signal to an adequate extent, and the sync word is not recognized. The synchronism between the [lacuna] is thus lost. After a prescribed time, the original speed is adopted again.

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Patent claims

1. A method for selectively changing the transmission speed between two transmission devices, having a subscriber line network which links a first transmission device (MUX) to a plurality of further transmission devices ($T_1 \ldots T_n$) and via which information signals and control signals are routed,
characterized
in that information signals and control signals are inserted into a frame structure,
in that the frame structure has a management channel (M) in which information relating to the increase in the transmission speed is communicated to the remote station,
in that the sending transmission device transmits the information signals at an increased transmission speed, as a result of which the synchronism with the remote station is lost,
in that, upon receiving the information transmitted in the management channel (M), the remote station itself increases the speed until the synchronism with the sending transmission device is restored.

2. The method as claimed in claim 1,
characterized
in that the frame structure is formed from at least one superframe having a plurality of single frames.

3. The method as claimed in claim 1,
characterized
in that the first transmission device is in the form of a multiplex device (MUX).

4. The method as claimed in claim 1,
characterized
in that the further transmission devices are in the form of subscriber terminals ($T_1 \ldots T_n$).

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Abstract

Method for transmitting information signals in the subscriber line domain.

As transmission speeds continuously increase, it is necessary to use transmission techniques which permit optimum utilization of the particular transmission medium. In the subscriber line domain, the transmission medium used is cables. In this case, the transmission rates need to be matched to the bandwidth of the cable during operation as well. The transmission methods used in the prior art are able to meet these requirements only to a limited extent. The invention provides a remedy for this by virtue of information signals and control signals being transmitted in a frame structure at variable speeds, and by virtue of the control signals being able to be used for matching the transmission speed to the cable and to the requirements of the subscriber.

Figure 2

FIG 1

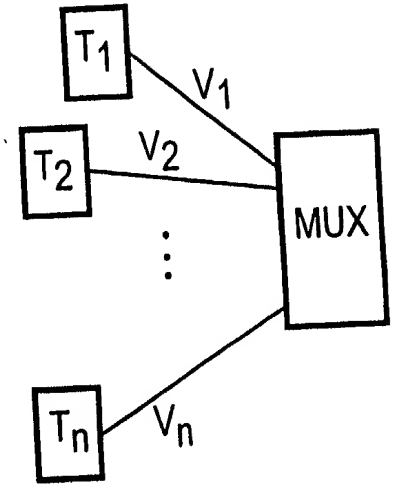
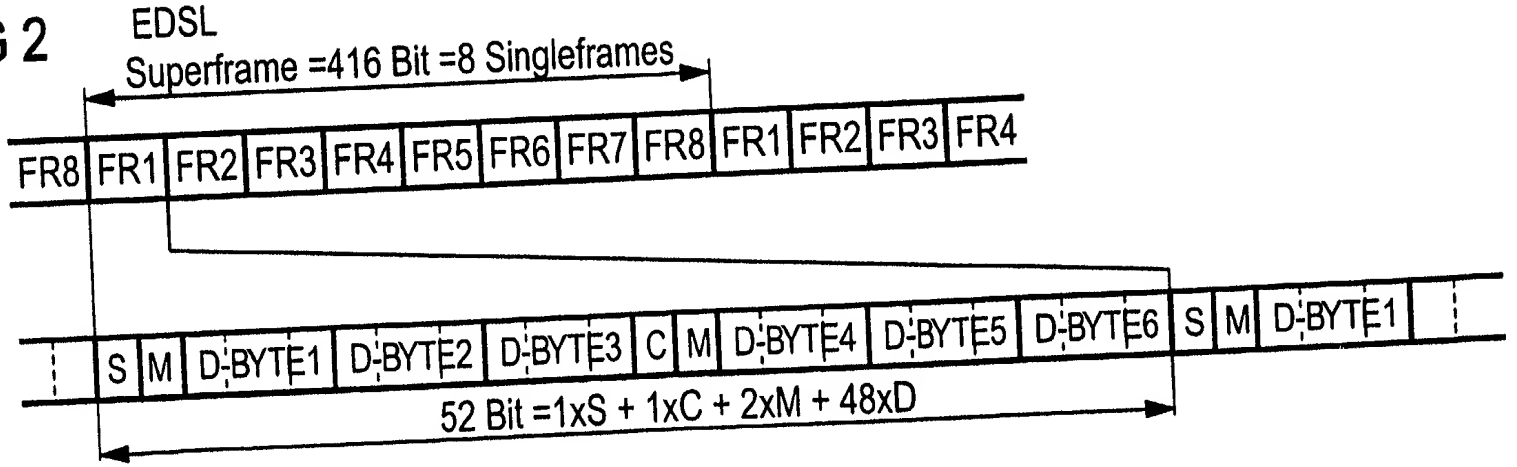


FIG 2



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I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Verfahren zum Uebertragen von Informationssignalen im Teilnehmeranschlussbereich.

Method for transmitting information signals in loops

deren Beschreibung

the specification of which

(zutreffendes ankreuzen)
☐ hier beigefügt ist.
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Prior foreign appplications
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			Priority Claimed	
19850870.0	DE	04.11.1998	☒	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
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PCT/DE99/03499 (Application Serial No.) (Anmeldeseriennummer)	02.11.1999 (Filing Date D, M, Y) (Anmeldedatum T, M, J)	_____ (Status) (patentiert, anhangig, aufgegeben)	(Status) (patented, pending, abandoned)
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(Supply similar information and signature for third and subsequent joint inventors).

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